

SECTION 3

Septic Systems and Residential Issues

3.1 IDENTIFYING PROBLEMS

3.1.1 What Was Already Known:

Prior to initiating the watershed planning effort, it was widely known that most Indiana soils, including those found in Morgan County, are not suitable for the long-term utilization of septic systems.

In early 2001, when the SWCD moved forward with meetings among those participating in the Watershed Initiative, community complaints and outside studies had already identified several concerns related to failing septic systems in several neighborhoods and at rural residences throughout the county. A few priority areas were identified inside the subject watershed.

The Morgan County Health Department had been receiving questions and concerns about individually owned septic systems, and complaints from citizens about odor and potential bacteria problems coming from neighboring septic systems were also being received by the Health Department. Individual septic-related complaints came in from a variety of local areas. However, the problem areas (for septic systems) inside the watershed, based upon information provided by the Morgan County Health Department include Patton Lake/Patton Park, Lambs Creek upstream and downstream of Patton Lake, Lake Hart, and Lake Edgewood.

During the watershed study and planning phase, the Morgan County Commissioners were studying and considering several options for a regional sewer district. An early consideration for extending sewers and creating a district was the Patton Lake community. In September 2000, a Preliminary Feasibility Study of Wastewater Management Alternatives for Patton Park, Inc. was prepared by Linda J. Allen, P.E. and submitted to the Indiana Rural

Community Assistance Program (RCAP). The report clearly exhibited a need for corrective action to the septic problem, and provided several options. However, due, in part, to potentially high individual costs to citizens, public support and interest was not established for a sewer district, and the geographic area of interest was shifted outside of the watershed.

In August of 2001, the RCAP produced a statewide report on septic priorities in Indiana called the "Findings for the Unsewered Community Database". Over 400 rural communities were scored against one another based upon a criteria rating system that considered such issues as numbers of water bodies impaired by *E. coli*, the location if upstream of an impaired water body, average lot size, local income levels, soils, current means of sewage disposal, a recreation/swimming rating, and water supply. Two Morgan County communities, Lake Hart and Patton Park Lake both scored a 78 out of 100 in this rating system, ranking them in the 87th percentile for priority and eligibility for funding programs that are typically facilitated by RCAP.

In addition to the two aforementioned studies, some *E. coli* bacteria problems were already identified by sampling completed by IDEM and the Morgan County Health Departments. Many of the problems identified by the Health Department were concluded to be the direct result of either failing or poorly designed septic systems.

3.1.2 What Was Learned During the Process

As noted in Section 1, which is the Introduction Section of this plan, the City of Martinsville and the Town of Monrovia both provide treatment of wastewater, or household sewage at Publicly Owned Wastewater Treatment (POTW) plants located in the respective municipalities. However, when considering the total population in the watershed (approximately

12,000 estimated households based upon a collective analysis of US Census figures, aerial photography, and plat maps), the number of customers served by the POTW in Monrovia (140) and the number of customers served by the City of Martinsville (4800) (source: Janice Brock, Martinsville Utility Office). The number of customers billed in this case does not equate to numbers of individuals utilizing the system, and only about 50% of Martinsville falls within the subject watershed. Based upon this information, it is estimated that there is a range of persons between 5000 and 8000 that utilize septic systems inside the watershed.

Therefore, it is estimated that between 5000 and 8000 persons in a 52,438 acre watershed must deposit human-generated wastes (feces, food wastes, bathwater, etc.) into something other than a sanitary sewer system, presumably septic systems and, on occasion, illegal direct discharges to local waters.

As a result of information reported by the Morgan County Health Department, the Watershed Initiative's Land Use Committee discussed and prioritized issues related to septic systems early in the planning process. Thereafter, discussions and concerns were voiced about failing septic systems, odor problems, and lack of county funding to address such problems at two of the quarterly public stakeholder meetings.

After 12 months of surface water sampling and monitoring, the coordination team then analyzed the findings related to *E. coli*. It was learned that, as had been the claim and concern from the local stakeholders, *E. coli* counts that exceeded State standards were indeed present at several sampling locations in the watershed, including some locations not listed by the State as impaired. Suspect locations were confirmed to exceed the standards including areas in Lambs Creek, which is listed by the State as being impaired due to the presence of *E. coli*. Local data collection also identified

additional locations where *E. coli* exceeded State standards in at least one in ten samples taken. Those locations included sampling locations in the subwatersheds of Sycamore Creek, Dry Fork-Sycamore Creek, Highland Creek, and Lambs Creek both upstream and downstream of Patton Lake (See table 3:1 and sampling results discussed in Appendix B).

After the analysis of data and its potential relationship to current land uses, preliminary priority areas, as well as potential causes and sources were established by the coordination team. Those areas, causes, and sources were then published on the Soil and Water Conservation District's Internet web site and presented to the Land Use Committee on February 18, 2003. The results of that meeting led to the conclusions and recommendations in this section.

Another residential issue that was learned during the watershed planning process was that private property dump or refuse sites as well as salvage-automobile storage and accumulation is widespread on private properties within the watershed. This situation was also prioritized by the Watershed Initiative committees as a residential issue of priority for water quality protection.

It was learned that the West Central Morgan County Solid Waste Management District holds an annual Tox-Away Day household hazardous waste exchange program in Martinsville. Additionally, waste paint turn-in programs are arranged periodically through a cooperative effort between the Solid Waste Management District and the City.

3.1.3 Causes or Probable Causes of Impairments and Threats

E. coli is a measurable pollutant in the watershed and is one primary reason for the State of Indiana's Department of Environmental Management listing Lambs Creek and White River as impaired on their Section 303(d) list of impaired water bodies.

The presence of such bacteria is not only potentially dangerous to humans, but can also cause decreases in dissolved oxygen in the water column, which in turn can affect the survivability of fish and wildlife.

As is described in detail in Appendix B and summarized for each sampling site location on page B-21, *E. coli* has been identified in elevated concentrations at 6 of the 7 sampling sites, and low dissolved oxygen was also identified at these locations.

While *E. coli* can be considered a cause of water quality impairment in the watershed, the ultimate source of *E. coli* is human and animal feces. *E. coli* lives in the intestinal tract of warm-blooded animals, and can therefore enter surface waters from failing septic systems and areas of congregation of both domestic and wild animals. *E. coli* from livestock such as horses and cattle are specifically discussed in Section 6, *Livestock Management Issues*. The human source of *E. coli* is discussed in this section, as it was the consensus among Watershed Initiative participants that a primary human source of *E. coli* in the watershed is directly related to failing septic systems and/or inappropriately piped waste systems or “strait pipes” that expel sewage directly from homes into surface waters.

A related source of *E. coli* can be that of a failing sewage treatment process or a sewer overflow. Combined sewer overflows, or “CSO’s” have not been identified in the watershed. However, bacteria levels exceeding state water quality standards have been identified during stream monitoring in Sycamore Creek at the sampling location downstream of Monrovia schools and the recently constructed Monrovia wastewater treatment plant.

3.1.4 Sources or Probable Sources of Pollutants or Conditions Causing Water Quality Impairments

Impairment #1 – Lambs Creek Bacteria: Current levels of *E. coli* found in Upper and Lower Lambs Creek exceed Indiana’s water

quality standards (See Appendix B). The following sources of data were utilized to determine this impairment:

- IDEM’s 303(d) List of Impaired Waters
- NRCS Unified Watershed Assessment
- Local field sampling data performed as part of this Watershed Management Plan process (see Appendix B).

The probable source(s) of this impairment are livestock operations (covered in Section 6), failing septic systems, and direct discharges of sewage from residents to surface waters in areas of Lamb’s Creek just before it enters Patton Lake.

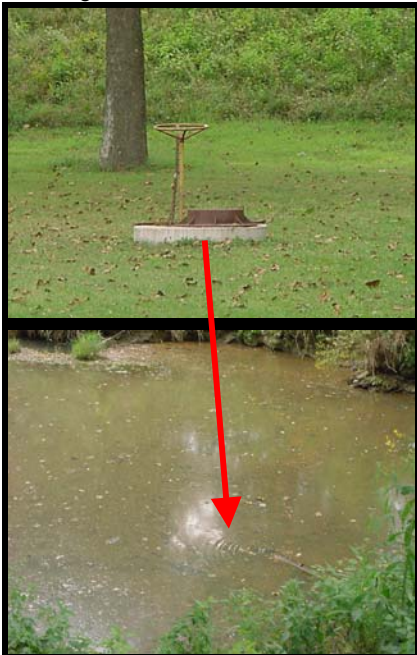
The land use of *Upper Lambs Creek* is rural residential in nature with approximately 15 small, unregulated livestock (horse and beef cattle) operations (covered in Section 6). Septic systems are prevalent on and upstream of Patton Lake, which is an impoundment within Lambs Creek. Direct discharge pipes were observed by the coordination team on Upper Lambs Creek prior to its impoundment at Patton Lake.

Figure 3.1 – homes along Lambs Creek near its entry to Patton Lake. Many have problematic septic systems or direct sewage discharges to the creek.



Data (see Appendix B) suggests that *Lower Lambs Creek*, which is below Patton Lake and drains the Lambs Creek-Goose Creek subwatershed, is impaired by the consistent presence of bacteria and low dissolved oxygen (D.O.), which occur immediately after and as a direct relation to the opening of and discharge from the sediment release valve below Patton Lake dam. The purpose of the valve is to release bottom sediment that accumulates in Patton Lake, with the intention of maintaining some depth to the impoundment. The discharge occurs, on average, about once per month for 8 hours at a time (source: Patton Lake Association). The discharge flows directly into a small ditch/tributary, which in turn flows westward a few hundred feet into Lower Lambs Creek. Surface flow over Patton Lake dam does not appear to have significant bacteria impact, rather, the below dam discharge is the identifiable source. Sampling and analysis suggest that the dissolved oxygen is so low at times, as a result of organic decomposition in the lake sediment, that the *E. coli* bacteria cannot even survive near the discharge point. This can have an enormous negative impact on fish and wildlife.

Figure 3.2 : Patton Lake sediment release and discharge into Lambs Creek



Personal interviews with residents downstream of the lake indicate that when the sediment release valve is opened, at least one half of a mile of Lower Lambs Creek turns black in color, and small fish kills have been observed on numerous occasions. One resident who has lived next to the creek for over 40 years, noted that the quality of fish in this section of stream has gone from gamefish (such as bass and bluegill) to mostly carp and leeches.

Figure 3.3 – Apparent effects from low dissolved oxygen in Lambs Creek below Patton Lake



In conclusion, failing septic systems and illegal strait pipes that pump sewage from homes to surface water are believed to be a significant source of bacteria that collects in Patton Lake. When the lake's sediment control valve is released, pollution from the lake is discharged from the bottom of the lake through a pipe, and into a feeder ditch to Lower Lambs Creek. This is believed to be a significant source of both *E. coli* bacteria and decomposing lake sediment that is, at times, so anaerobic, that even the bacteria cannot survive.

Impairment # 2 – Upper Sycamore Creek

Field sampling shows *E. coli* bacteria exceeding State water quality standards in Sycamore Creek, at the sampling point downstream of Monrovia (see Appendix B) where there is a wastewater treatment plant, a package treatment plant for Monrovia schools, and a small number of livestock . This location was not previously identified

by the State as impaired for *E. coli* on their Section 303(d) list. Data collection and analysis that were performed as part of this Watershed Management Plan process (see Appendix B) identified this impairment.

The probable cause(s) of this impairment are either one or a combination of the following:

- Inadequate chlorination at the POTW
- Failing treatment system at the school
- Septic systems not clearly identified in field surveys
- Livestock grazing in the area

Figure 3.4 - If not properly operated, the Monrovia Wastewater Treatment Plant could, at times be a source of bacteria in Sycamore Creek; however, operators are well-trained and equipment is new.



Table 3.1 – Indiana *E. coli* bacteria standard

<i>E. coli</i> - Recreational Use Support (Swimmable)			
Bacteria (cfu = colony forming units.)	No more than one grab sample slightly > 235 cfu/100ml, and geometric mean not exceeded.	No samples in this classification.	One or more grab sample exceeded 235 cfu/100ml, and geometric mean exceeded.

Other Residential Pollutants

In addition to the *E. coli* bacteria, other pollutants are or may be present in the watershed, such as waste oil, antifreeze, and gasoline. The typical cause of such pollutants is automobile wastes, and the typical source is the local private automobile “dump”.

Several locations have been observed in the watershed where many apparently unusable automobiles are stored, other materials (i.e., paint, mineral spirits, etc.) were dumped in what appeared to be minor quantities on local properties, and petroleum products from residents who may have historically poured used automobile oil on areas of

residential lawns to control weeds or otherwise disposed of the unwanted liquid.

Also observed throughout the watershed were personal garbage dumps, where pollutants of concern might include household hazardous wastes, pesticides, herbicides, and other chemicals.

3.1.5 Prioritization

Priority areas for Septic and residential issues were identified as geographic areas. The location and size of the priority areas have been based upon three primary factors:

(1) The identification of pollutants or poor water quality conditions known to be related to septic systems and residential land uses: *E. coli* is a measurable pollutant of concern and is prioritized in this section for two reasons: first, because its source can be traced to such residential issues as septic systems; and second, because it is the primary reason for listing certain water bodies (Lambs Creek and White River) on the State's Section 303(d) list of impaired water bodies.

(2) The area of land upstream of and surrounding the polluted area that is assumed to be contributing to the pollutant. This assumption is due to known land uses or other factors identified in field observations.

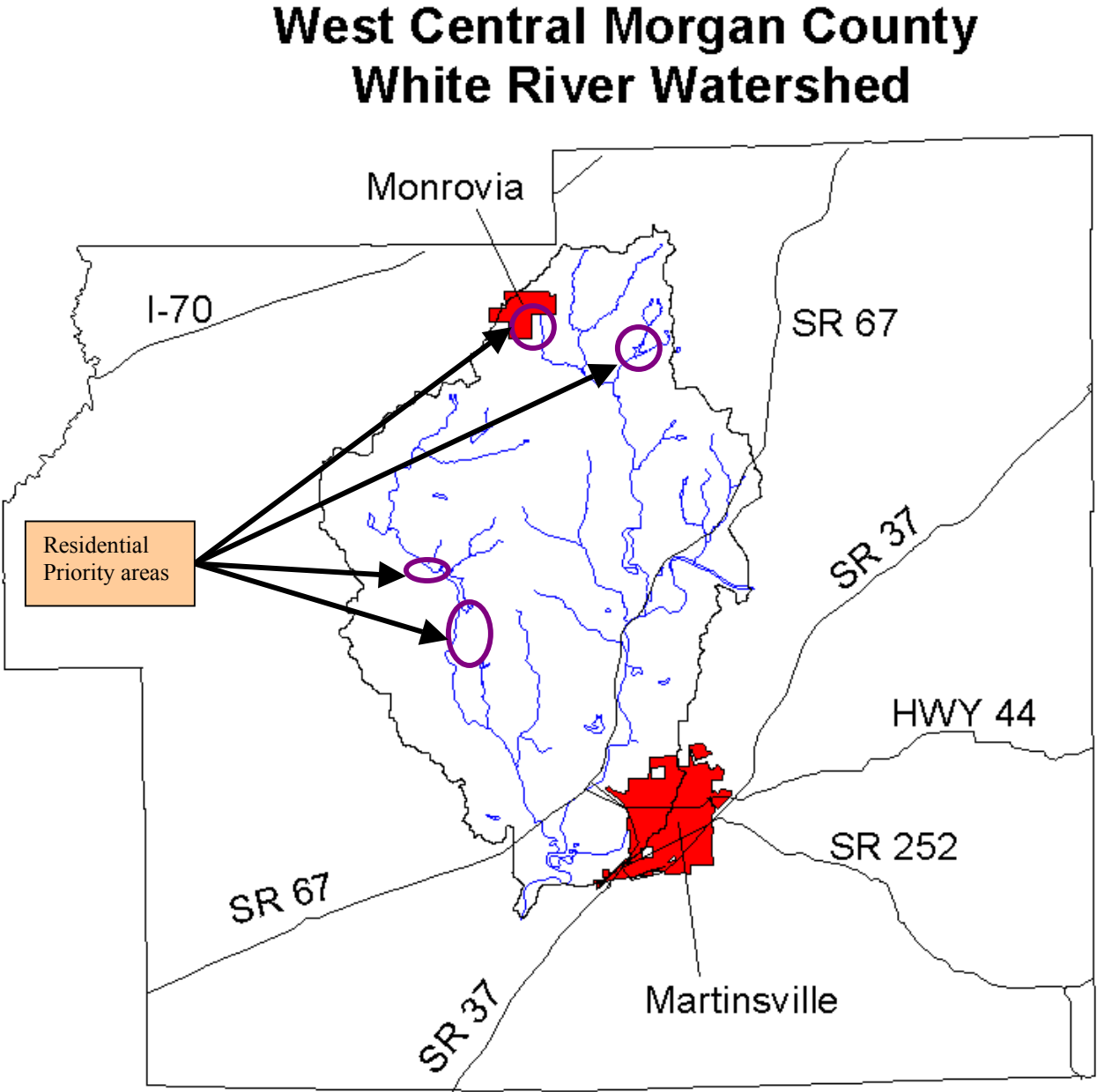
(3) Residential properties where dumps or automobile salvage/storage has been observed.

The map shown as figure 3.4 on the following page identifies the Priority Areas for septic and residential issues in the watershed. Table 3.2 provides some prioritization specifically related to *E. coli*.

Table 3.2 - Area prioritization table for *E. coli*

Sample Site # on map	Location	Number of <i>E. coli</i> exceedances in 12 samples	Number of <i>E. coli</i> exceedances during recreational season (April-October)	Is location in a Section 303(d) listed segment of stream and scheduled for TMDL?	Other extenuating factors related to bacteria – detailed in Appendix	Priority Rank Order for <i>E. coli</i>
1	Dry Fork Sycamore Creek at CR 950 North	4	2	No	No	5
2	Sycamore Creek at CR 950 North	6	4	No	No	4
3	Sycamore Creek at Robb Hill Road	1	1	No	No	6
4	Highland Creek at SR 67	4	2	No	No	5
5	Lambs Creek upstream of Patton Lake at Upper Patton Road	3	1	YES	No	3
6	Lambs Creek downstream of Patton Lake at Lower Patton Road	1	1	YES	YES	1
7	Lambs Creek at Old SR 67	6	5	YES	No	2

Figure 3.4



3.2 GOALS AND DECISIONS

3.2.1 Goals for Improvement and Protection:

Primary Goal #4 of this Watershed Management Plan, as outlined in Section 1 of this document is, “to the greatest extent possible and with existing and potential resources, improve and protect water quality in the watershed with the intention, where applicable and appropriate, to achieve and maintain state water quality standards.” In order to achieve Primary Goal #4 of this Watershed Management Plan, the following objectives related to septic systems and residential issues have been established:

3.2.2 Action Plan

The Morgan County Soil and Water Conservation District will identify appropriate funding sources to address *E. coli* through a process of elimination in four zones as well as the implementation of public outreach, education, and agency cross-training efforts. This process will include efforts discussed in Section 6 of this Plan.

Objective #3-1:

Within the next 6 years, bring *E. coli* levels within compliance of state water quality standards in Lambs Creek, both north and south of Patton Lake, for 12 months out of the year.

Action 3-1

Zone #1 in figure 3.8 (Upstream of Patton Lake)-The effort to address *E. coli* in this zone is addressed in Section 6, Livestock Management Issues.

Action 3-2

Zone #2 in figure 3.8 (Lambs Creek upstream and adjacent to Patton Lake)- Conduct a feasibility study for a consolidated/clustered septic system to redirect flow from failed septic discharge from approximately fifty (50) homes clustered on small parcels along Lambs Creek just north of and adjacent to Patton Lake. Prepare to pursue additional funds for

design and construction pending the outcome of the feasibility study.

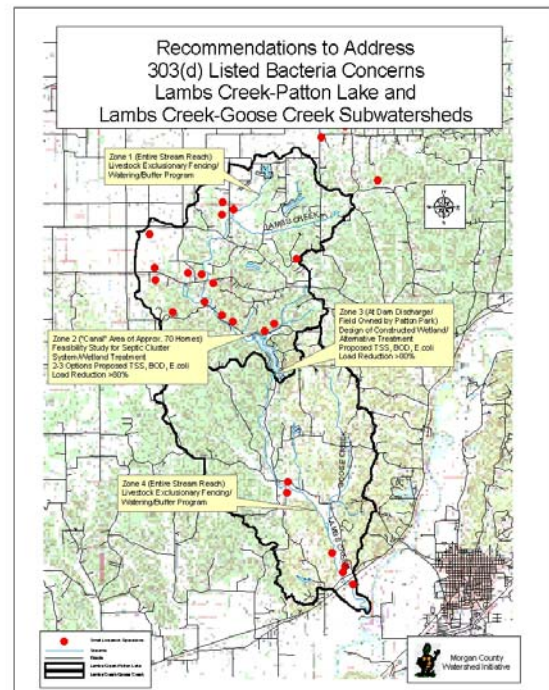
Action 3-3

Zone #3 in figure 3.8 (Downstream of Subsurface Discharge on Patton Lake)- Prepare a feasibility/preliminary engineering study for the construction of subsurface wetlands to treat water purged from the Patton Lake dam into the agricultural field below the dam owned by the Patton Lake Association. Prepare to pursue additional funds for design and construction pending the outcome of the feasibility study.

Action 3-4

Zone #4 in figure 3.8 (Lambs Creek downstream of Patton Lake)- The effort to address *E. coli* in this zone is addressed in Section 6, Livestock Management Issues.

Figure 3.8: Focus Areas and Proposed measures to address *E. coli* in Lambs Creek.



Objective #3-2:

Within the next 5 years, bring *E. coli* levels within compliance of state water quality

standards directly south of Hart Lake for 12 months out of the year.

Action 3-5

Pursue opportunities for regional sewer hookups between Hart Lake residents and the Monrovia wastewater treatment plant via the development of a regional sewer district. Such an action will be examined and led by the County Commissioners with information support and prioritization from the SWCD, the Morgan County Health Department, and partners in the Morgan County Watershed Initiative.

Objective #3-3:

Within the next 2 years, bring *E. coli* levels at the sampling location in Sycamore Creek downstream of the Monrovia Wastewater Treatment Plant and Monrovia Schools within compliance of state water quality standards for 12 months out of the year.

Action 3-6

Meet with the WWTP operator as well as with representatives of Monrovia schools in order to ascertain if there is indeed any bypass, failure, or other problem on record during the times of above-standard *E. coli* readings. Investigate with additional sampling if necessary. Balance results and conclusions against the possibility of contamination from any livestock in area. Pursue appropriate corrective action after the actual *E. coli* source is identified.

Objective #3-4:

In localities where it is not likely that state water quality standards for *E. coli* can be met, such as some urban areas, implement management practices and corrective action projects to reduce *E. coli* by 10% per year.

Action 3-7

Implement a community education program that focuses on residential causes and preventative measures for bacteria in municipalities, including septic system maintenance and pet waste cleanup.

Objective #3-5:

Limit the potential of ground and surface water contamination from private, residential property management through the reduction of existing and continuing disposal of refuse, household hazardous wastes, and salvage automobiles, and the improper storage of chemicals.

Action 3-8

Increase knowledge of and aggressively promote the household hazardous Waste/Tox-Away programs offered by the regional West Central Solid Waste Management District. Increase participation in the program by 50% over the next five years.

Action 3-9

Develop and implement a public awareness campaign that emphasizes the aesthetics of Morgan County, issues related to property value, and the value and importance of not accumulating refuse, garbage, and scrap material on private properties.

Action 3-10

Adopt and enforce more stringent county and municipal codes that specifically limit or prohibit garbage and refuse collection on private properties. Encourage a county coalition among the commissioners, the County Prosecutor, the County Planning Department, and the County Health Department to ensure that any such existing or proposed codes are consistently enforced.

Action 3-11

Through public awareness campaigns, educate the public about the proper use and storage of residential fertilizers, pesticides, and herbicides in order to avoid overuse and associated runoff as well as improper storage and associated spills.

Objective #3-6

Through watershed teaming (see Section 9) establish cross-training programs and procedures between the SWCD and the County Health Department to collectively understand, identify, and report septic

maintenance problems and illegal dumps.

Action 3-11

Through watershed teaming (see Section 9) cross-train between the Morgan County Health Department, the County Surveyor, and the Morgan County SWCD regarding: proper septic system installation, maintenance and indications of failure; regions of soil type and soil suitability; pending development and new surveys; and other issues related to collective knowledge and notification of potential or existing septic problems.

3.2.3 Loads or Contributions for the Management Measures

As the actions proposed in this section are preliminary studies, the load reductions will be applied in the actual feasibility and preliminary engineering studies. However, it can be noted that experts in the field of alternative treatment methods utilizing constructed wetlands have estimated that bacteria can be reduced by up to 90% and D.O. can be dramatically increased with proper design.

3.2.4 Management Measures:

Several management measures could be implemented in order to achieve the objectives 1-5. One such measure would be, pending the outcome of current state legislation, to establish a Regional Septic Management District in Morgan County. Details regarding this development will be dependent upon the outcome of the 2003 or future legislation.

Another management measure that will be necessary is the continued evaluation of need and solutions related to the establishment of regional sewer districts for areas with septic problems.

A final management measure will involve the development and enforcement of local ordinances that pertain to refuse collection and automobile storage on residential properties.

With respect to specific areas of concern, it is proposed that alternative natural treatment systems be evaluated to address the issue identified as Impairment # 1, at the location just below Patton Lake in Lambs Creek. A preliminary engineering/feasibility study of such a project is proposed. The study would analyze options for, capabilities of, and potential costs of constructed wetlands and retention areas for the water purged from the Patton Lake dam into the agricultural field below the dam, enabling treatment of the water that is purged once per month for 8 hours and usually carries a high bacteria count and an extremely low dissolved oxygen count. The results of the study should allow the District or other entities to determine whether actual design and construction of the alternative treatment system is feasible and appropriate as well as how much it will cost. The District will contract with a design consultant that has expertise in the area of alternative treatment systems, constructed wetlands, and the like.

3.2.5 Resources

Resources available or needed for achieving education and outreach goals are divided into human resources and funding resources:

3.2.5.1 Human Resources

Currently, the Soil and Water Conservation District staff, IDNR staff, NRCS staff, and voluntary Supervisors would likely be available for participation in the regional teaming and cross-training. Additionally, the Watershed Initiative Land Use Committee, a strictly voluntary group of stakeholders who have been meeting for 2 years, have committed themselves to remain available participants in watershed education and to assist and help direct many of these activities. Most of these committee members have indicated a willingness to provide themselves as part of a speakers bureau to help perpetuate the water quality message to the public.

3.2.5.3 Funding Resources

The primary funding necessary to

implement the actions proposed in this section will include engineering services to prepare feasibility studies and ultimately (potentially) design and construction of alternative treatment projects. Funding resources that will be pursued (see Section 10 for funding for specific actions) will include: Section 319 watershed management funding from US EPA through IDEM; similar programs such as Section 104(b)(3) and Section 205(j) funding; local county and city appropriations from Public Works and related budgets; Lake and River Enhancement (LARE); awards from local utilities; and private donations; The remaining efforts in this section constituted some minor staff scheduling changes, which should not be costly.

3.2.6 Legal Matters:

As part of the feasibility and preliminary engineering studies discussed in this section, the requirements for and likelihood of acquisition of discharge permits for any constructed wetland and/or consolidated septic system will have to be addressed. In addition, the transfer of or easement access of property, specifically that property which is located south of the Patton Lake dam, will have to be coordinated legally and approved by all parties.

3.3 MEASURING PROGRESS

3.3.1 Indicators Selected to Determine Progress

Indicators selected to determine progress with the reduction of *E. coli* in accordance with the four objectives discussed in Section 3.2.1 will be the absence and/or presence of *E. coli* in measured colony forming units per milliliter at the sampling sites identified in Appendix B of this Plan.

The Morgan County Soil and Water Conservation District has already been awarded additional Section 319 funds to continue sampling and monitoring for *E. coli* and other pollutants in the watershed for

another 2 years. However, it is proposed that locally implemented water quality sampling and monitoring for *E. coli* continue in the watershed for at least 6 years, in order that progress toward achieving the objectives discussed in Section 3.2.1 is appropriately measured.

3.3.2 Monitoring Indicators

Primary indicators for improvement will be *E. coli*, dissolved oxygen, and if appropriate, periodic observations of macroinvertebrate populations. The continued sampling for *E. coli* following the same sample site locations, timing, and methods will be employed.

3.3.3 Operation and Maintenance

Operation of the education and outreach components of this section will be led by the SWCD with direct involvement of the Education and Outreach Committee.

Operation and maintenance of any constructed wetland or other physical project proposed herein will be discussed in appropriate detail during the feasibility and design phases of such projects.

3.3.4 Re-Evaluation of Plan

The Morgan County Soil and Water Conservation District will be responsible for the regular review and update of this Watershed Management Plan. This Plan should be evaluated on an annual basis to document and celebrate progress; assess effectiveness of efforts; modify activities, if needed, to better target water quality issues; and keep implementation of the Plan on track. The Plan should be revised as needed to better meet the needs of the watershed stakeholders and meet water quality goals.

A summary of the actions proposed for this plan and a detailed list of potential funding sources can be found in Section 10 of this document.